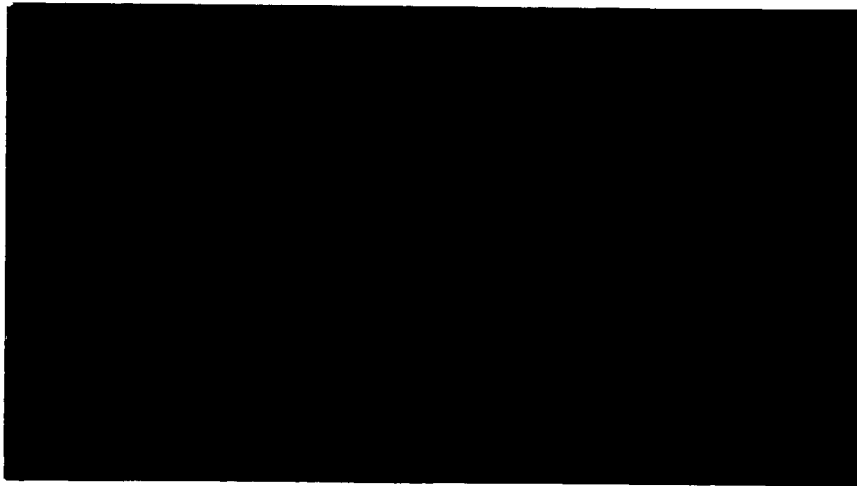


NORTH CAROLINA SCIENCE AND TECHNOLOGY RESEARCH CENTER



FACILITY FORM 602

**N67-33093**

(THRU)

**103/RS25**

(PAGES)

(CODE)

**29A CR-873092910**

(NASA CR OR TMX OR AD NUMBER)

(CATEGORY)

**34**

TWELFTH QUARTERLY PROGRESS REPORT  
ON A  
REGIONAL TECHNOLOGY TRANSFER PROGRAM  
April 1, 1967 -- June 30, 1967

<sup>A</sup>  
TWELFTH QUARTERLY PROGRESS REPORT,

ON A

<sup>3</sup> REGIONAL TECHNOLOGY TRANSFER PROGRAM <sup>4</sup>

Submitted by

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*29B. QPR-12 END*

<sup>25</sup>  
Contract NSR-34-007-003 - *27ACV*

Period Covered: April 1, 1967 <sup>1</sup> June 30, 1967 <sup>9</sup> *110CV*

## ABSTRACT

North Carolina Science and Technology Research Center, Research Triangle Park, North Carolina.

TWELFTH QUARTERLY PROGRESS REPORT ON A REGIONAL TECHNOLOGY TRANSFER PROGRAM, APRIL 1, 1967--June 30, 1967.

Contract NSR 34-007-003

During the quarter the STRC furnished regular service to 45 subscribing companies and provided computer searches on request to five other agencies, including two firms, two universities and one research institute. The Center supplemented its information plan by adding an automated vendor catalogue library. A symposium to bring new technology developed by universities and industry to the attention of potential user companies drew wide attendance and added to dissemination activities. Four cases of potential or actual transfer of technology to STRC clients are reported. During the Thirteenth Quarter, the Center will seek new clients and renewals from present subscribers. Efforts will continue to obtain computerized files of chemical and textile literature.

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## APPENDIX A - CASES OF TECHNOLOGY TRANSFER

\* \* \* \* \*

# NORTH CAROLINA SCIENCE AND TECHNOLOGY RESEARCH CENTER

## TWELFTH QUARTERLY PROGRESS REPORT

### I. INTRODUCTION

This is the Twelfth Quarterly Progress Report to be submitted to the Technology Utilization Division of the National Aeronautics and Space Administration and describes the operation of a regional dissemination center for new technology. The program was started in June, 1964, under contract NASr-235, and is currently supported by NASA under contract NSR 34-007-003. Program support is also provided by the North Carolina Board of Science and Technology and by subscription fees from participating companies.

Objectives of the experimental program are "the enhancement and acceleration of the process of transferring new technology derived through Government sponsorship to uses additionally benefiting the private and public sectors of society."

Work relating to dissemination activities under contract NSR 34-007-005 is covered in a separate progress report.

### II. STAFF

On June 30, 1967, the staff of the North Carolina Science and Technology Research Center (STRC) consisted of the director, the assistant director for operations, the assistant director for marketing, a technology utilization manager, four applications engineers, an information specialist, a computer programmer, a technical editor, an assistant librarian, an accountant, six clerical assistants, and two secretaries. Added during the quarter were three part-time, temporary employees: a computer programmer, a clerical assistant, and a consultant.

### III. ACTIVITIES

#### A. STRC Operations

On June 30, 1967, STRC was furnishing regular services to 47 subscribing companies. Computer searches were provided on a demand basis to six organizations.

Companies receiving services under annual subscriptions are listed below.

- Aeroglide Corporation
- Aerotron
- Alladdin Industries
- Allvac
- American Enka
- American Lava Corporation
- American Machine & Foundry Company**
- Athey Products, Incorporated**
- Avco Corporation**
- Beaunit Fibers**
- Biomedical Applications Team, Research Triangle Institute**
- Burlington Industries
- Carolina Medical Electronics, Incorporated
- Celanese Fibers Company - Charlotte
- Celanese Fibers Company - Rock Hill
- Chemol, Incorporated
- Coltron Industries, Incorporated
- Cornell-Dubilier Electric Corporation - Fuquay Springs
- Cornell-Dubilier Electric Corporation - Sanford
- Corning Glass Works
- Dependable Machine Company
- Engineering for Industry
- Exide Missile & Electronics Division, Electric Storage Battery Company
- Genesco Incorporated
- Gilbert & Barker Manufacturing Company
- Great Lakes Research Corporation
- Hackney Brothers Body Company

Hercules, Incorporated  
Hilemn Laboratories, Incorporated  
International Business Machines  
ITT Telecommunications  
Lenoir Wood Finishing Company  
Medical Specialties, Incorporated  
Northrop Carolina, Incorporated  
Payne & Associates  
Pneumafil  
Reynolds Metals Company  
R. L. Sparrow  
Standard Crankshaft Company, Incorporated  
Superior Cable Corporation  
Tar Heel Engineering & Manufacturing Company  
Taylor Instrument Company  
Technitrol, Incorporated  
Thermatics, Incorporated  
Thomasville Furniture Industries, Incorporated  
Uster Corporation  
Westinghouse Electric Corporation

Services have been provided on request to the following organizations:

Allied Chemical Corporation  
Chemstrand Research Center  
North Carolina State University  
Research Triangle Institute  
Stencel Aero Engineering Company  
University of North Carolina - Psychiatric Department



## 1. Computer Activities

We have continued to process our search questions using the NASA Mod II linear search system on a Model 1410 computer in Richmond, Virginia. We have made efforts to strengthen our operations at this location with the installation of a newly supplied linear file and creation of a complete backup file which is maintained at the same level of integrity as our operating file. Searches are processed weekly.

New procedures have been instituted to insure the integrity of our computer output; this has resulted in a relatively higher quality level for machine-produced information.

The inverted search system for the IBM Model 360 computer has been further refined. Additional testing awaits the availability of sufficient direct access storage capacity on local System 360 computers.

## 2. Information Resources

In Section IV C of the Eleventh Quarterly Progress Report, we stated that STRC was evaluating several microfilm libraries of vendor catalogues with the anticipation of adding one of them to supplement our information collection.

During this quarter, the microfilm vendor catalog file marketed by Information Retrieval Inc., a division of ASCAM, Inc., Palo Alto, Calif., was obtained on a one-year subscription basis.

The microfilm library itself has arrived. The reader/printer and other supplies are expected presently, permitting service to begin at that time.

A brochure describing this service has been prepared and will be printed after pictures of the completed library have been taken. The mass media will be asked to publicize the service, and The Industrial Extension Service at North Carolina State University has planned an article on the service in their monthly newsletter. It has a distribution to several thousand businessmen and industrial officials throughout the state.

Vendor catalogue services will be offered on the same basis to both clients and non-subscribers to the STRC information system. For a yearly fee of \$100, STRC will provide up to 10 individual searches. Additional searches will be \$10 each.

It is expected that this additional resource will increase the tendency of clients to turn to STRC, and thus ultimately increase usage of the NASA information system.

### 3. Services to University Researchers

STRC's ability to serve a researcher at North Carolina State University has gained favorable reference to both this agency and the NASA information system in a paper presented at a nationwide professional meeting.

Entitled The Use of Computers in Ceramic Research, the paper was presented in May in New York City at the sixty-ninth annual meeting of the American Ceramic Society.

The author, Dr. Hayne Palmour, III, professor of engineering research, describes a number of uses for electronic computers in scientific research and testifies to their value in literature searching.

In this and previous report periods, Dr. Palmour and student assistants working under his direction sought information from STRC on the use of computers in research and particularly in those areas of research dealing with materials.

Two bibliographies were prepared for Dr. Palmour by Technology Utilization Manager J. Graves Vann, Jr. They were entitled "Computer Applications in Ceramic Research" and "Influence of Grain Boundaries on Deformation and Strength in Single Crystals, Bicrystals, Tricrystals, and Polycrystalline Substances."

Following are excerpts from Dr. Palmour's paper:

"Literature Searches

"Any new investigation must rely upon a study of the literature to bring the experimenter up to an appropriate level of cognizance and competence in that area of research, and to assure him that what he is about to do has not been done before. A thorough literature survey by the classical method is educational, but it is one of the most tedious aspects of research. Fortunately, many current research reports and documents are being indexed by key words [derived from the title, abstracts, and body] and are readily accessible by computer search techniques.

"In preparation for this presentation a computer processed search was made of government documents [from N.A.S.A.'s STAR and A.I.A.A.'s International Aerospace Abstracts] by the North Carolina Science and Technology Research Center.<sup>2</sup> Figure 1 lists the key words chosen for this particular search. They are organized into three groups representing ceramic materials, computers, and research applications. A bibliography was retrieved for the documents which had been indexed by appropriate combinations of these terms. For example the combination ceramic, computer, and application retrieved a paper originated at Oak Ridge National Laboratory entitled 'Mathematics and Computing, and Statistical Research, Applications, and Programming in Biological and Physical Sciences.'

"Similarly, another very successful search was conducted for us on the 'Influence of Grain Boundaries on Deformation and Strength in Single Crystals, Bicrystals, Tricrystals and Polycrystalline Structures.'<sup>3</sup> About 35 citations were reviewed and 40 pertinent abstracts were obtained, yielding more than 30 documents of significant interest.

#### "References

- "1. Vogel, Norman A., 'Computer-Assisted R & D,' Research/Development 16 p 26, May (1965).
- "2. N. C. Science and Technology Research Center Bibliography No. 885, 'Computer Applications in Ceramic Research,' March 14, 1967.
- "3. N. C. Science and Technology Research Center Bibliography No. 731, 'Influence of Grain Boundaries on Deformation and Strength in Single Crystals, Bicrystals, Tricrystals, and Polycrystalline Substances,' October 7, 1966.
- "4. Griem, P. D., 'Use of Computers in Process Control,' this Symposium."

#### 4. Symposiums

Sixty-three representatives from 49 companies as far away as California attended the Symposium on Advanced Technology Available for Commercialization, sponsored by STRC April 26-27, 1967. The attendees came from 14 states and Washington, D. C.

The conference was the first of its type to bring advanced technology developed in industrial and university research laboratories directly to those companies capable of using it commercially.

Most of the industry representatives indicated in STRC questionnaires that several of the 10 topics were potentially applicable to their company and would be investigated further.

Nine of the 10 speakers, in follow-up questionnaires, reported from 1 to 13 company contacts requesting conferences or further information. One of the speakers reported that six of his 13 requests came as a result of publicity that STRC arranged in professional journals. After these articles, the center itself received inquiries from several states, Hungary, Japan and Switzerland requesting copies of papers presented.

The speakers also reported that some companies have requested information on licensing or joint venture arrangements.

#### 5. Marketing Program

Marketing activities during the quarter centered on gaining new clients and obtaining renewal subscriptions from firms presently receiving the Center's services.

Agencies signing up for their initial subscription were Burlington Industries, Thomasville Furniture Industries, Inc., Standard Crankshaft Co., Inc., and the Biomedical Applications Team of the Research Triangle Institute. A present client, Gilbert and Barker Manufacturing Company, arranged for the vendor catalogue system now offered by STRC.

Renewals were obtained from Corning Glass Works and Taylor Instrument Company. Payne and Associates declined to renew. The total of current subscriptions as of June 30 was \$25,750. The total paid by agencies for computer searches on a demand basis was \$675.00.

B. Meetings, Trips and Visits

STRC Director Peter J. Chenery extended his duties to the following endeavors in these cities:

April 13-15--Pittsburg, Pa., attended Second Conference on Electronic Information Handling.

April 21--Wilmington, Mass., visited Avco Corporation to discuss plans for STRC's Symposium on Advanced Technology Available for Commercialization.

April 29--Chapel Hill, N. C., spoke to a luncheon meeting of the alumni of the School of Library Science at the University of North Carolina.

May 10-11--Washington, D. C., attended hearings of the Senate Subcommittee on Government Research of the Committee on Government Operations.

June 1--Columbus, Ohio, visited Chemical Abstracts Service to discuss addition of chemical literature to the STRC data base.

June 9--Rome, Ga., attended industry seminar arranged by NASA, the Office of State Technical Services (OSTS) of the Department of Commerce and the Atomic Energy Commission.

June 20--Washington, D. C., visited OSTs at the Department of Commerce to discuss the chemical literature program.

June 22--Washington, D. C., visited NASA headquarters to discuss STRC operations.

### C. Statistics

This section lists the number of documents disseminated by STRC during the report period. Categories of usefulness have been established by STRC engineers, based on information from client companies and on the engineers' judgement in light of the companies' interests and capabilities.

Figures in this section represent complete documents.

#### 1. Search mailings

a. <u>Categories</u>	<u>Number sent</u>
Pertinent - - - - - 433	
(This classification is established for documents containing technology having a direct bearing on processes, products and equipment actually being used by the industries to which they are sent. Described are processes, etc., that may be readily adapted with a minimum of additional research and reorganization.)	
Interest - - - - - 96	
(Documents representing advancement in a given area of operation and relating to products, etc., that fit naturally and logically. Technology may be employed after additional in-house developmental research.)	
Background - - - - - -0	
(Documents which review state-of-the-art in a general area of interest which might serve to expand the receiving organization. Documents that contain theoretical and developmental research reports. Sent usually only to large companies with greater ability to understand and adapt new technology.)	

Total sent 529



b. Total STAR Documents (categorized)	- - - - -	269
Total STAR Documents (uncategorized)	- - - - -	35
c. Total IAA Documents	- - - - -	165
d. Total Documents from other sources	- - - - -	-60

(Open literature, in-house generated  
bibliographies not categorized.)

2. Industrial applications mailing

a. Number of research reports	- - - - -	469
b. Number of reprints of open literature plus documents prepared in-house	- - - - -	-226
c. Number of Tech Briefs and Flash Sheets	- - - - -	102
d. Number of companies sent to	- - - - -	60

3. Number of retrospective search requests

received from companies	- - - - -	-51
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4. Total number of scientific and technical

personnel receiving regular service from STRC	- - - - -	-1500
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Classification of Documents Sent in Search Mailings

1962 STAR

<u>Category</u>	<u>Number Sent</u>
01 - - - - -	1
08 - - - - -	3
09 - - - - -	1
16 - - - - -	3
18 - - - - -	6
19 - - - - -	1
21 - - - - -	3
Total	18

## 1963-64 STAR

<u>Category</u>	<u>Number Sent</u>
01 - - - - -	2
02 - - - - -	1
06 - - - - -	6
07 - - - - -	4
08 - - - - -	2
09 - - - - -	9
10 - - - - -	1
11 - - - - -	1
12 - - - - -	1
13 - - - - -	1
16 - - - - -	6
17 - - - - -	7
18 - - - - -	8
19 - - - - -	8
20 - - - - -	1
23 - - - - -	2
24 - - - - -	1
25 - - - - -	1
32 - - - - -	1
33 - - - - -	2
34 - - - - -	2
Total	67

## 1965-67 STAR

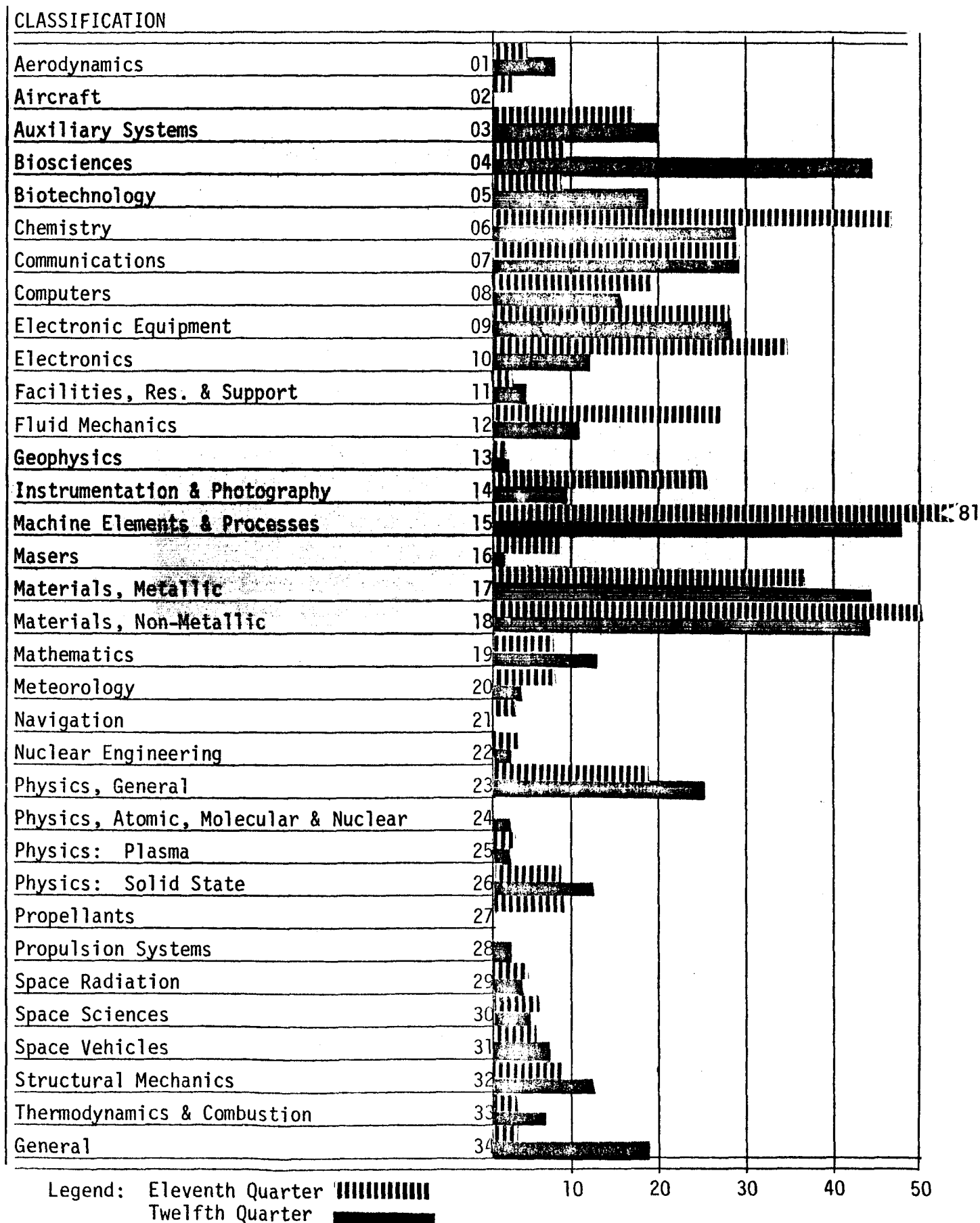
<u>Category</u>	<u>Number Sent</u>
03 - - - - -	10
04 - - - - -	24
05 - - - - -	1
06 - - - - -	13
07 - - - - -	9
08 - - - - -	9
09 - - - - -	18
11 - - - - -	2
12 - - - - -	1
14 - - - - -	3
15 - - - - -	20

17	-	-	-	-	-	-	-	-	21
18	-	-	-	-	-	-	-	-	14
20	-	-	-	-	-	-	-	-	1
22	-	-	-	-	-	-	-	-	1
23	-	-	-	-	-	-	-	-	5
25	-	-	-	-	-	-	-	-	1
26	-	-	-	-	-	-	-	-	6
29	-	-	-	-	-	-	-	-	2
31	-	-	-	-	-	-	-	-	1
32	-	-	-	-	-	-	-	-	6
33	-	-	-	-	-	-	-	-	1
34	-	-	-	-	-	-	-	-	12
Total									181

Documents bearing no category  
 (received and distributed before  
 arrival of STAR) - - - - - 35

The graph on the following page illustrates the total number of documents, with 1967 Classifications, transferred by STRC in the Eleventh and Twelfth Quarters.

## ELEVENTH AND TWELFTH QUARTERS



#### D. Computer Searches

A total of 50 computer searches in the Quarter produced 6,708 citations. These resulted in 1,553 evaluated abstracts which were mailed to client companies. Searches were as follows:

##### **Selected Fiber and Fabrics Properties and Processes for Enhancement**

Chemical Modification of Textile Fibers

Effect of Environmental Conditions on Fibers & Fabrics

Surface Treatment of Fibers and Fabrics

Thin-Layer Chromatography

Textile Processing & Selected Fibers & Polymers

Natural, Glass, and Commercial Organic Fibers & Fabrics

Sea Water Batteries

##### **Iron Additives to Aluminum Alloys**

The Interaction of Molten Aluminum with Refractories

##### **Biomedical Pressure Sensors**

Zinc Impurities in Aluminum Ores and their Removal

##### **Fatty Acids**

Aluminum Mining and Beneficiation

Nickel-Cadmium Batteries

Carbon and Graphite Fibers & Fabrics

Pyrolysis of Plastics

Effect of Environmental Conditions on Fibers & Fabrics

Coatings

Cutting-Slitting-Metallurgy of Tooling

Whole-Body Antennas

Adhesives

Properties of Molten Metals

Properties of Molten AL, CU,FE,CO,NI, and Steel

Pulse Transformers and Delay Lines

Computer Processing of Physiological Data

Silver Oxide-Zinc Battery DDC

Sea-Water Activated Batteries

F-102 Aircraft Escape System

Body Armor

Fireproof Materials

Radome Construction of Ceramic Materials  
 Noise Blanking  
 Coupled Stress  
 Heating  
 Wood  
 Polyvinyl Chloride and Polypropylene  
 Contract Administration  
 Plastic Bearings  
 Mitochondria  
 Chemotherapy-Depression and Schizophrenia  
 Nylon  
 Polyester  
 Fibers, Fabrics, and Fiber-Forming Polymers  
 Titanium Gears  
 Discriminator Threshold  
 Selected Modern Developments in Hydrodynamics  
 Pneumatic Tire Mechanics  
 Electrostriction  
 Teflon Fibers

#### E. Identification and Measurement of Technology Transfer

STRC will continue its program for the identification, measurement, and evaluation of transfer of technology to commercial uses. Under the plan, each subscribing company is assigned to a staff applications engineer who reviews all activities for his companies quarterly. Potential or apparent transfers are investigated and reported.

Each case report is checked for completeness by STRC's director of communications, who works with the engineers to assess any benefits resulting from a transfer. Cases previously reported are reviewed quarterly for new developments.

Because of the confidential relationship existing between STRC and its clients, many cases must be reported without company identification; some cases are sufficiently unique that company identity would be obvious, and these cannot be included in published reports. Case files are maintained at STRC, however, and are available for review and evaluation by the STRC staff.

Cases of transfer which can be described without compromising client proprietary interests are included in Appendix A.

#### IV. PLANS FOR NEXT QUARTER

##### A. Marketing

We will seek to obtain renewals from subscribing companies whose agreements expire during the quarter. An effort will be made to obtain subscribers for the vendor catalogue information service which will become available during the quarter.

The present Assistant Director for Marketing will become a full-time employee during the coming quarter. He will concentrate on contacting new prospects and will conduct a campaign in states adjacent to North Carolina. Revisions to the slide presentation used to explain STRC services are planned to make it more suitable for different types of audiences, and also to reflect new services.

##### B. Computer Searching

Equipment configurations at several local computer centers will be changed during the coming quarter, and we are following these changes closely to determine when it will be feasible to transfer searching operations back to a local facility.

Programming efforts will continue to be devoted to an inverted system for System 360 computers, with an associated linear file for full citation retrieval. Sufficient direct access storage capacity for the latter file is expected to be available in October, 1967.

#### C. Information Resources

We are continuing efforts to obtain files of chemical and textile literature. We hope to conclude an agreement for an experimental chemical literature program during the coming quarter. In the textile area, we are studying several experimental information systems to determine their availability and suitability for our client group.

#### D. Meetings

Planning is continuing for a conference on engineering uses of computers in the small company, to be held this fall.



## APPENDIX A - CASES OF TECHNOLOGY TRANSFER

New instances of information transfer and actual or potential application are presented in Cases 103 and 104. New developments are reported in Cases 55 and 98, which were first discussed in earlier quarterly reports.

### CASE NO. 55

For more than a year, STRC has continued to work with Medical Specialties, Inc., of Charlotte, N. C., in the development of a small, high speed, battery-powered surgical tool intended to drill, saw and remove skin for grafting. The case was first discussed in the Seventh Quarterly Report, and later in the Ninth Report.

This project has been indefinitely delayed, awaiting advancements in the battery and/or motor fields which would make possible a battery-powered hand piece of suitably small size.

Recently, because of his experience in battery technology, Applications Engineer G. M. Wylie became aware of a new development which could have application to the problem and notified the client.

Yardney Electric Company, one of the suppliers of silver zinc batteries to aerospace programs, has introduced a commercial D-size silver zinc cell. This particular cell size is not well suited for use in the device envisioned by Medical Specialties; however, as Yardney expands its line of cells in this area, it appears that batteries will become available which will make the desired surgical instrument feasible.

Since practically all silver zinc batteries have been used in aerospace and defense applications, it can be said that the introduction of the new line of Yardney cells is an extension of work which was originally performed for the aerospace or defense industries.

Medical Specialties has recently acquired other non-medical business interests that have diluted efforts to aggressively pursue development projects. However, Wylie states that company President John Gaylord will monitor future advancements in the battery and motor fields and incorporate new technology that is applicable to the desired product.

CASE NO. 98

As a result of attendance at the Symposium on Advanced Technology Available for Commercialization, sponsored by STRC on April 26th and 27th, a North Carolina firm has retained the services of Dr. Chester Gleit to investigate mirror production in low-temperature plasmas.

The president and vice-president of the company, whose identification number is 0391, met in private conference with Dr. Gleit, associate professor of chemistry at North Carolina State University, following his presentation on "Chemical Applications of Radiofrequency Discharges."

As discussed previously in the Eleventh Quarterly Progress Report, the company is a chemical supplier to the mirror industry. Because of the shortage and rising cost of silver metal, the firm is seeking a replacement process for the currently used silver nitrate method of making mirrors. Their contract with Dr. Gleit represents another potential solution to this problem in addition to those described previously.

Under the agreement reached, Dr. Gleit will investigate deposition of metals on glass in low-temperature plasmas produced by radiofrequency discharges. Deposition of certain metals by this means has been previously demonstrated by Dr. Gleit. (They cannot be identified until he has published his results.) His efforts for the company will be directed toward development of a commercially suitable method for

producing mirrors with favorable reflective and economic characteristics in comparison with silver mirrors.

#### CASE NO. 103

STRC has provided vital basic assistance to the Research Triangle Institute's Biomedical Applications Team, resulting in more than a dozen actual or potential transfers of technology designed to apply aerospace technology to a wide range of medical and biological problems.

RTI's experimental efforts, also aimed at determining the most effective method of serving as an interface between the physical and life sciences, were supported for the year beginning June 15, 1966, by the Technology Utilization Division under NASA Contract NSR-34-004-035.

NASA is supporting the multidisciplinary Biomedical Applications Team (BATEAM) in order to facilitate the transfer of scientific and technical information to clinicians and biomedical researchers.

The primary objectives are to identify medical-related problems and needs which appear to be solvable by the application of science and technology resulting from aerospace research and development programs; to identify the specific technology or concepts which may lead to solutions of these problems; and to document actual transfers to achieve maximum utilization of the results of the program.

In attempting to find solutions to biomedical problems, the team, with the assistance of STRC Applications Engineer A. P. Denmark, initiated 18 computer searches of the aerospace literature in the NASA bank of information at STRC.

As a result of these searches, potential solutions to seven biomedical problems have been identified and evaluated. A number of other

possible solutions have also been identified and evaluations are being initiated at present.

One completed transfer has already occurred. It involves work in progress by Dr. F. L. Thurstone, professor and director of the Department of Biomedical Engineering at Bowman-Gray School of Medicine.

Dr. Thurstone is presently investigating a unique technique for displaying the structure of internal organs of the human body. This method can, in several ways, prove superior to X-rays. It involves the generation of an optical hologram from the information contained in ultrasonic energy reflected from these organs.

Advantages of ultrasonic energy are that it does not appear to be dangerous to the body as are X-rays; it is reflected from interfaces between different types of soft tissue and therefore allows visualization of structures which cannot be "seen" in radiographic images; and the image obtained with an ultrasonic hologram is three-dimensional.

Since the ultrasonic hologram is constructed from information obtained using ultrasonic energy having a wavelength of approximately 0.3 millimeters and the optical images are reconstructed using light having a wavelength approximately 3 orders of magnitude smaller, the reconstructed image contains significant spherical aberration. This aberration appears as a general degradation of the image.

Dr. J. N. Brown, Jr., director of the BATEAM, suggested to Dr. Thurstone that a computer search of the NASA information collection might prove helpful. From a search on "Imaging Techniques Using Ultrasound" (STRC Bibliography No. 767) the following document was produced that proved to highly valuable to Dr. Thurstone:

A65-30796 - Magnification and Third-Order Aberrations in Holography. Reinhard W. Meier (Xerox Corp., Rochester, N. Y.)

For some time, Dr. Thurstone had attempted to derive equations which, when applied to ultrasonic holograms by digital image processing, would help eliminate distortions caused by spherical aberration during image reconstruction. This document aided in obtaining quantitative descriptions of third order aberrations and supported Dr. Thurstone's work on this phase of the problem, as well as furnishing other complex equations that will eventually tie into future work on this project.

Dr. Brown had been involved in image processing techniques for X-rays and knew of work at NASA's Jet Propulsion Laboratory which might be pertinent.

Dr. Robert Nathan and Mr. Robert Selzer at JPL cooperated with the biomedical program by writing a computer program for the spherical aberration correction, and this correction was applied to an ultrasonic hologram supplied by Dr. Thurstone. A general improvement of the reconstructed image obtained using the corrected hologram was observed. Equally important is the fact that it has been demonstrated that holograms can be processed without degradation being introduced by the scanning and digitizing processes.

The results of the 17 other computer searches are in various stages of consideration, ranging from review by medical staff, to identification of possibly useful technology, and detailed evaluation.

In a report describing the biomedical applications of NASA science and technology, Dr. Brown discussed the advantages of NASA's regional dissemination centers (RDC's) and particularly the North Carolina Science and Technology Research Center.

He wrote, "We have found that the RDC can be extremely valuable to this program in ways other than simply allowing us to search computer tapes containing aerospace articles and reports. The RDC personnel generally become very familiar with NASA programs and industrial research and development programs supported by NASA. They have frequently directed us to contact individuals at NASA centers who have been able to furnish information related to specific problems and needs. Further, they have frequently suggested NASA-generated technology surveys which were pertinent to specific problem areas. In general, we have found that contacts with individuals made through the Science and Technology Research Center have been at least as valuable as the results obtained from the computer information searches."

Dr. Brown continued, "Finally, to facilitate this information searching part of the program, we are attempting to build up a complete file of survey and state-of-the-art types of reports as well as NASA program reports. Having this kind of information on hand is of great value in rapidly identifying activities within NASA which are pertinent to specific biomedical problem areas."

#### CASE NO. 104

A client firm manufacturing electronic components is presently evaluating literature and consulting advice made available by STRC for potential solutions to a sealing problem.

An electronics division of an out-of-state corporation, this company employs about 1,000 persons. Its identification number is 0193.

The company uses cylindrical tubes made of polypropylene, polyethylene and polyvinyl chloride as housing for the components. It is necessary to seal these devices by potting both ends of the tubes, and the company desires to improve the adhesion between the potting compound and the plastic surfaces to eliminate or minimize moisture penetration at weakly bonded interfaces.

Consequently, the company's manager of tubular engineering sought information from STRC on means of improving the adhesion of the plastics with the end result of higher product quality and reliability.

A search of the NASA system by Applications Engineer Virginia M. Cordle retrieved no information pertinent to this problem. Mrs. Cordle then conducted a manual search of Chemical Abstracts from 1957 through October, 1966 (Bibliography MC5) and produced 61 references on the subject. Methods cited for improving the adhesion of polyolefins and polyvinyl chloride included new adhesive formulations and, secondly, various pretreatments such as: chemical etching, hot air or flame oxidation, ultraviolet light combined with heat, ozone, chlorine, chlorinated hydrocarbons, sulfur dioxide, or sulfur monochloride, and exposure to electrical discharges, either alone or in combination with low-temperature plasmas.

The company stated that the information added considerably to their knowledge in presenting several possible approaches toward obtaining the desired improvements in adhesion.

Several of the references provided to the company cited the efficacy of cold plasmas in improving the adhesion of plastics. Among them are

Hansen, Pascal, DeBenedictis, and Rentzepis, "Effect of Atomic Oxygen on Polymers," J. Polymer Science, Part A: 2205-2214 (1965).

Hansen and Schonhorn, "A New Technique for Preparing Low Surface Energy Polymers for Adhesive Bonding," J. Polymer Science, Part B: 203-209 (1966).

A particularly desirable feature of the low-temperature plasma treatment is the fact that the resulting modifications are a surface phenomenon; the bulk properties of the plastic are unaffected by the exposure.

In transmitting this bibliography, Mrs. Cordle suggested that the company investigate the use of low-temperature plasmas produced in radiofrequency discharges to effect improved adhesion. Dr. Chester Gleit, associate professor of chemistry at North Carolina State University and STRC consultant, is interested in the problem and he offered to run some pilot trials using this approach. The company forwarded polyethylene and polypropylene tubes for the experiments, which are now in progress.

As soon as Dr. Gleit has completed the trials, the treated electronic component tubings will be returned to the company for potting and subsequent testing. Moisture penetration will be compared with that obtained on control (untreated) tubes. If these preliminary trials yield the anticipated improvements, the company will pursue development work either in their own laboratories or through a contract with Dr. Gleit.